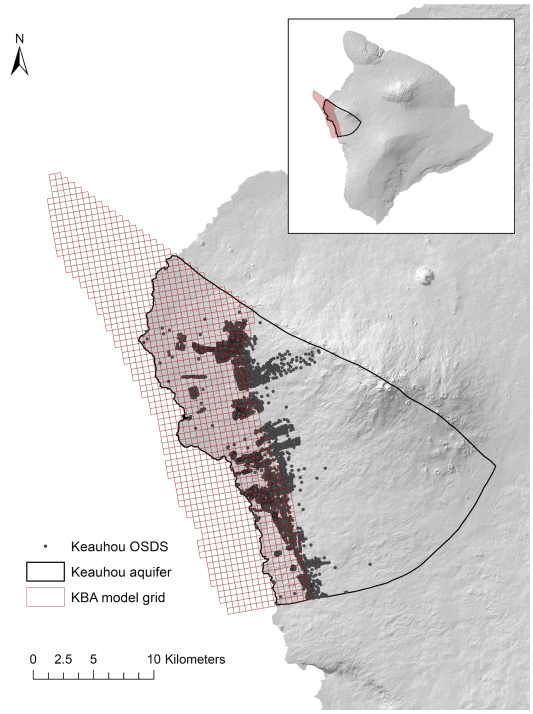
LINKING LAND AND WATER MANAGEMENT TO CULTURALLY AND ECOLOGICALLY IMPORTANT GROUNDWATER DEPENDENT ECOSYSTEMS

Project Objectives

1. Document the current and historical uses and values of groundwater dependent ecosystems (GDEs) in Kona, using interviews, Hawaiian language newspapers, and other archives.
2. Assess the impacts of future scenarios of urban development, wastewater management, forest protection, and climate change on groundwater flow and quality to culturally and ecologically valued nearshore ecosystems and other GDEs in the Keauhou aquifer.
3. Evaluate the costs and benefits of cesspool upgrade scenarios in terms of impacts to nearshore ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystems which rely on groundwater. In Kona, Hawai‘i coastal GDEs include: fish ponds (loko i‘a), anchialine pools, and nearshore ecosystems. Communities and agencies are working to restore and protect these ecosystems for their linked cultural and ecological values, and seek information on the interacting impacts of wastewater management, urban development, forest management, and climate change.

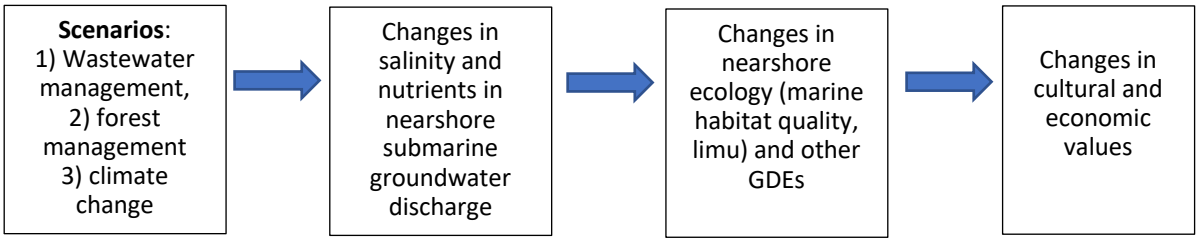
Keauhou Basal Aquifer (KBA) Groundwater Model



The KBA model is a management tool to evaluate how land and water management affect groundwater nutrient concentrations and salinity with implications for drinking well water quality and GDEs. *Note: The KBA model does not evaluate bacteria, pesticides, and other contaminants which can also impact wells and GDEs.*

Expected Project Outcomes:

Improved understanding of the multiple ways that people use and value GDEs.
Quantified potential impacts of land use and climate change on groundwater quality (nitrogen and salinity) and growth of native, culturally valued versus invasive limu species.
Improved knowledge base for spatial prioritization of cesspool upgrades to protect drinking wells and nearshore ecosystems.



General framework to link changes in climate and land and water management to culturally and ecologically important GDEs.

Scenarios:

So far we have considered the impact of interacting scenarios of: 1) cesspool upgrades and future development (including groundwater pumping):

No.	Scenario Name	Cesspool Conversion Type (Efficiency)	WWTP upgrade
	Current	None	N
	Future permitted build out	None	N
1	All ATU; upgrade	All ATU (high)	Y
2a	Targeted, low efficiency; no upgrade	Targeted (low)	N
2b	Targeted, high efficiency; no upgrade	Targeted (high)	N
3a	Targeted, low efficiency; upgrade	Targeted (low)	Y
3b	Targeted, high efficiency; upgrade	Targeted (high)	Y
4	No cesspool change; upgrade	None	Y

We will also consider scenarios of **protection and restoration of native forest** in the mauka (upland) portions of the aquifer recharge area that affect groundwater recharge. These urban and forest land management scenarios will be crossed with future **climate scenarios** to assess how changes in rainfall, and subsequently groundwater recharge, influence groundwater discharge to and salinity of the nearshore environment and resultant growth of native and invasive limu.

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